

WATERSHED MANAGEMENT PLAN
NORTH FORK AND BEETREE WATERSHEDS

Buncombe County, NC

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PREPARED FOR
CITY OF ASHEVILLE

By

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Introduction

The Asheville Watersheds are classified by the North Carolina Department of Environment and Natural Resources, Division of Water Quality, as a Watershed-1 watershed (WS-1). WS-1 watersheds are essentially natural, undeveloped watersheds, publicly owned, with no permitted point source (wastewater) discharges or development. This designation is for watersheds used for drinking water, culinary or food processing and warrants maximum protection of water quality.

Silviculture, subject to the Forest Practices Guidelines Related to Water Quality (15 NCAC 11.6101- .0209) is permitted. Timber has been harvested from the watershed several times. Most recently, two small clearcuts were performed in the early 1990s. Significant areas of Beetree reservoir were logged approximately 40 years ago. Prior to that, it appears that both harvesting occurred in Beetree and North Fork Watersheds between 60 and 90 years ago. A small amount agriculture was also apparent from existing old fields and from yellow poplar stands that appear to have resulted from natural seeding in old fields or pastures in North Fork Watershed. The presence of old home sites would suggest early agricultural activities prior to public ownership.

This Forest Management Plan is intended to provide guidance in the management of the forest resource to accomplish multiple objectives. Ownership of a very large tract of forestland imposes a responsibility of stewardship, for current and future beneficiaries. Among the benefits provided are quality water, varied wildlife habitat, plant biodiversity, and scenic views from the Blue Ridge Parkway.

General recommendations of this plan are made for guidance in pursuing the particular objectives set forth in the plan. The recommendations are made with flexibility to apply a variety of silvicultural tools to varying conditions to accomplish objectives. Particular recommendations for specific areas will be made after the general recommendations are reviewed and accepted. The specific recommendations will be incorporated into a 10 year schedule of activities, the first five years of which will be very specific. The second 10 years will be less specific and somewhat dependent on activities accomplished in the first 5 years. Included in the activities will be an annual schedule for inventory of compartments. Information collected will include species composition, basal areas, volume by product, understory and ground cover conditions, site productivity, fire hazard, road and trail conditions, exotic invasive species and insect and disease assessment.

Best forest management practices will be followed and used to management the watersheds. All forest management practices will comply with the Asheville Watershed Conservation Easement. Any recommendations or practices not in compliance with the easement will not to be acted upon without prior City of Asheville City Council approval. An annual plan specific to each fiscal year detailing management concerns and requested actions will be brought to City Council for approval before any forest management work is initiated other than emergency maintenance, such as tree removal resulting from storm damage or other catastrophic events which may occur. City Council will receive a written report detailing any major watershed maintenance issues resulting from such

non-scheduled events. City staff will work closely with the North Carolina Conservation Trust to develop annual plans for managing the watersheds.

OBJECTIVES OF MANAGEMENT

The primary objectives of forest management are to:

1. Maintain the functions of the forest contributing to water quality,
2. Reduce the risk of catastrophic loss by fire, insects or disease to preserve the ability of the forest to function as a watershed.
3. Provide other such services as may be desirable that are not in conflict with the primary purpose of the watershed.

Within these broad objectives, more specific objectives include:

- maintain the water quality functions of interception, filtration and retention of rainfall,
- protect and improve forest health,
- improve and maintain existing interior access for fire control and emergency services,
- promote and increase native biodiversity,
- provide and improve critical habitat for wildlife species such as black bear, ruffed grouse, wild turkey and neo-tropical migratory songbirds,
- provide sites for re-establishment of the American chestnut,
- maintain a scenic view from the Blue Ridge Parkway,
- generate periodic income from small selective timber harvests.

PROPERTY DESCRIPTION

I. OWNERSHIP:

The city of Asheville owns the two watersheds in fee simple. A conservation easement was given to The Conservation Trust for North Carolina for all land above 3600 feet in elevation. The Blue Ridge Parkway runs in and out of the watershed on the northwest, north and northeast sides of the two watersheds. U.S. Forest Service lands or National Park Service lands comprise the northern boundaries. The western boundary is primarily rural residential. The southern boundaries adjoin B.V. Hedrick Gravel and Sand Co., C.B.U. Christian Fellowship, Beetree Land Partnership, various rural residential parcels and individual residential lots. The southeastern boundary adjoins lands of Mountain Retreat Association (Montreat).

II. LOCATION:

North Fork Watershed is located east of Swannanoa and north of Black Mountain in Buncombe County, NC. It extends from the Great Craggy Mountains ridge line on the west, above the Blue Ridge Parkway to the crest of the Black Mountain ridge line and the Yancey County line, which defines the northeast side of the watershed. The eastern and southeastern boundaries are the ridge of Middle Mountain, along the Buncombe - McDowell County line. The watershed encompasses the origins of the Swannanoa River. Burnett Reservoir impounds the water just above the influx of Walker Branch from the east and Laurel Branch from the west. Little Craggy Knob is within this watershed; Craggy Dome, Bullhead Mountain, Locust Knob, Walker Knob, Blackrock Knob, Potato Knob, Bald Knob, Pinnacle Mountain and Greybeard Mountain are along the perimeter of the watershed.

Beetree Watershed lies east and a little south of North Fork Watershed and is contiguous with North Fork Watershed. The two watersheds share a common ridge along a portion of the Great Craggy Mountains, which forms Beetree's eastern boundary. The northern boundary, lying just north of the Blue Ridge Parkway, is the ridge connecting Craggy Pinnacle, Bearpen knob and the ridge just below Snowball Mountain. The western boundary extends southwest along the ridge, across the Parkway, then down the ridge to Paynes Knob, then southeast along the ridge to the south end of Brushy Mountain. Beetree Reservoir impounds Beetree creek above the influx of Spruce Fork. Fork Mountain, Craggy Gardens and Craggy Knob are within this watershed.

III. EVALUATION OF FOREST CONDITIONS:

1. TERRAIN

The terrain in both Beetree and North Fork Watersheds is mountainous. North Fork Watershed has more area of flat valley bottomland than Beetree Watershed, but both have significant areas of steep slopes and narrow ridges. North Fork enjoys a more extensive road system. Rock cliffs, outcrops, waterfalls and balds are present within both watersheds, as well as in the more productive coves and hollows.

2. PLANT COMMUNITIES

The valleys, or bottomlands, have a wide variety of tree, shrub and ground cover species. Yellow-poplar, Frazer magnolia, white oak, black oak, northern red oak, scarlet oak, white ash, black birch, mockernut hickory, pignut hickory, shagbark hickory, bitternut hickory, black cherry, American beech, red maple and eastern hemlock are common trees. More unusual tree species found in this area include butternut and black walnut.

Spicebush, American holly, hornbeam, rhododendron, mountain-laurel, flowering dogwood, redbud, pepperbush, maple-leaf viburnum and sourwood are common in the understory. Less common shrubs include hazelnut and strawberry bush.

Ground cover common to these sites were partridgeberry, cinquefoil, cardinal flower, jewelweed, asters, greenbrier, Christmas fern, lady fern, New York fern and club moss.

Invasive exotic species observed include Japanese spiraea (*Spiraea japonica*), Nepalese browntop grass (*Microstegium vamineum*), Chinese plume grass (*Miscanthus sinensis*), Autumn olive (*Elaeagnus umbellate*), multiflora rose (*Rosa multiflora*), oriental bittersweet (*Celastrus orbiculata*) and periwinkle (*Vinca minor*).

The coves are generally dominated by yellow-poplar, black birch and red maple. Various oak species, cucumber magnolia, Frazer magnolia and eastern hemlock are scattered throughout the coves, as well.

Understory and ground cover species are similar to those found in the bottomland areas. Alternate-leaf dogwood occasionally may be found on these sites.

Invasive exotic species observed include Nepalese browntop grass (*Microstegium vamineum*), Chinese plume grass (*Miscanthus sinensis*), oriental bittersweet (*Celastrus orbiculata*), multiflora rose (*Rosa multiflora*) and periwinkle (*Vinca minor*).

The dry ridges are dominated by oak species, blackgum and an occasional white pine or pitch pine. The drier sites are occupied by chestnut oak, scarlet oak, red maple, black locust and black gum. Less dry sites are dominated by white oak, scarlet oak, northern red oak, black oak, chestnut oak, blackgum, Frazer magnolia and red maple. At the higher elevations, sugar maple is common, along with black cherry. Carolina hemlock is also present.

The understory on the drier sites is dominated by mountain laurel, with huckleberry present, but generally not thriving. The less dry sites have mountain laurel, sourwood, huckleberries, blueberries, wild azaleas, American holly, hazelnut, flowering dogwood and chinquapin. American chestnut sprouts are common. A few red spruce trees are present at higher elevations in the understory.

The ground cover on the dry sites includes galax, wintergreen (pipsissewa), trailing arbutus and smilax (greenbrier). Rattlesnake plantain and wintergreen are common on the less dry sites, along with lousewort, cinquefoil, and Christmas fern.

Invasive exotic species observed were Nepalese browntop grass (*Microstegium vamineum*), Chinese plume grass (*Miscanthus sinensis*) and multiflora rose (*Rosa multiflora*).

3. PLANT LIST

There is a wide variety of native plants in the two watersheds. The greatest variety occurs in the moist cove sites, the bottomland sites and along the roads and trails. Closed canopy conditions or heavy laurel thickets limit flowering and fruiting of many species of shrubs and ground cover.

Shrub species observed include mountain laurel, rhododendron, huckleberry, low bush blueberry, dwarf blueberry, black raspberry, blackberry, strawberry bush, beaked hazelnut, spicebush, wild azaleas, sweet pepperbush, redbud, flowering dogwood, alternate-leaved dogwood, chinquapin, American chestnut sprouts, buffalo-nut, witch-hazel, maple-leaved viburnum, sweet shrub, sassafras, smooth sumac, winged sumac, serviceberry, striped maple, sourwood, American holly, American hornbeam, Carolina silverbell, hawthorn and elderberry.

Wildflower species included rattlesnake plantain, wintergreen, spotted wood lily, showy orchis, crane fly orchis, pink lady slipper, putty root orchid, wild iris, wild geranium, fawn's breath, windflower, white wood aster, other asters, white morning glory, Queen Anne's lace, cardinal flower, wild violets, turtle heads, striped gentian, oxalis, wild hydrangea, white-leaf hydrangea, partridgeberry, everlasting, trailing arbutus, stonecrop sedum, American orpine, whorled coreopsis, wild rose and black-eyed Susan.

Herbs observed included black cohosh, blue cohosh, bloodroot, yellowroot, Solomon's seal, false Solomon's seal, spikenard, wild mint, jewelweed, Indian cucumber root, mayapple, alum root, American bugbane, self-heal, white baneberry, goat's-beard and goldenseal.

Ferns observed included Christmas fern, lady fern, wood fern, New York fern, cinnamon fern, maidenhair fern, hay scented fern, broad beech fern, ebony spleenwort and polypody fern.

Other forbs, vines and weeds observed included twisted stalk, dayflower, cinquefoil, mock strawberry, poke weed, Joe Pye weed, greenbrier, wild peas, poison ivy, Virginia creeper, Dutchman's pipe, dewberry, beggar-ticks, robin's plantain, cleavers, galax, smartweed, goldenrod, muscadine grape, mustang grape, fox grape, St. Andrews cross, lousewort, carrion flower, dodder, stinging nettle, bear corn, ground pine, heartleaf and thistle.

Club moss, spike moss, reindeer moss, pinesap and Indian pipes were also observed at various locations.

4. TIMBER ASSESSMENT

Timber quality within the two watersheds varies with site productivity. The very dry ridges have poor timber quality, in spite of the relatively old age of the timber present. This is a function of several factors. These sites are limited by available water and soil structure. Mountain laurel frequently restricts regeneration of tree species and past logging practices have degraded the species composition through high-grading. Basal areas range from 20 to 80 square feet/acre. Diameters are frequently over 18 inches, but trunks are short, twisted, crooked or diseased. Chestnut oak, scarlet oak, blackgum and black locust are the most prevalent species. White pine and pitch pine may be present.

On the more productive sites, timber quality is good to excellent. Yellow-poplar is the dominant species in most of the coves. Cucumber magnolia, eastern hemlock, black birch and red maple are also common. Basal areas range from 120 to 200 square feet/acre. Diameters range from 10 to over 30 inches, but average over 16 inches in many stands. The larger trees have 3.5 to 4.5 sawlogs.

White oak, northern red oak, black oak and scarlet oak are common on the drier productive sites, frequently occurring in patches where 2 or 3 species are dominant. Black cherry is found scattered across the landscape, but quality cherry is mostly found above 3500 feet in elevation. The scarlet oak is dying throughout the area. Unfortunately, it is being replaced with red maple, now present in the understory. Red maple, sugar maple, mockernut hickory, pignut hickory, bitternut hickory, shagbark hickory, cucumber magnolia, Frazer magnolia, American beech, chestnut oak and black birch are also present. Basal areas vary from 100 to 180 square feet/acre. Diameters range from 12 to over 30 inches. Trees have 1.5 to 2.5 sawlogs on average.

5. AGE AND STOCKING OF TREE SPECIES

Most of the dominant and co-dominant trees in the canopy of North Fork are 60-80 years old. There are 80-125 year old chestnut oaks and scarlet oaks on some of the ridges that were left after the last major harvest. At that time, these trees were too small or had little economic value in the existing market even though some were 60 years old. Several small stands, dominated by yellow-poplar, black birch, red maple and black locust, have populated areas that were clearcut in 1991 and 1992.

In the Beetree Watershed, more recent logging resulted in stands of 40 to 60 years in some areas, but stands that were not harvested in the last entry are around 90 years old.

Different species of trees have different life expectancies. White oaks and chestnut oaks are long-lived trees, as are northern red oak and hemlocks. These trees may live to be several hundred years old. Scarlet oak, on the other hand, tends to die between 75 and 125 years of age. Yellow poplar may live to be very

old, but a relatively small percentage of individual trees will live to be over 150 years old.

The scarlet oak throughout the North Fork Watershed is dying out. It is being replaced by red maple, a shade tolerant species prevalent in the understory. Over time, the forest canopy will become dominated by red maple, which will fill in the gaps left by individual tree mortality of most of the canopy species. (oak, yellow-poplar, hickory)

Many of the stands are becoming overstocked as diameters and crowns increase. As crowns shrink due to competition for light, less successful competitors die and fall. This natural process benefits many wildlife species by creating snags, and later, fallen logs. The practical problems created in this process, however, are the continual obstruction of access roads and the difficulty created by fallen logs in constructing fire lines around a wildfire.

7. INVASIVE EXOTICS

Invasive exotic plants, insects and diseases represent the greatest threat to forest health and native ecosystems. Not all exotic organisms are invasive. What makes an organism invasive is its ability to spread and occupy an ecosystem, unchecked by natural controls.

The chestnut blight completely changed the mountain forest ecosystem in a period of about 50 years. Exotic insects, plants and diseases have unlimited destructive potential because they are introduced into an environment where there are no natural controls. The associated balancing organisms of their native ecosystem, which developed over a long period of time in their natural range, did not get transported with the exotic organism. Our native plants have no resistance to these exotic disease organisms. Predators and parasites do not exist for exotic insect pests and plants have not developed chemical deterrents or resistance to exotic insects. Native wildlife frequently does not feed on exotic plants. Native species have not developed in association with the exotic plants and are not adapted to compete with them. The result is the displacement or loss of native species adapted to our ecosystems.

Increased international trade exposes our forests to increasingly more exotic pests. Horticultural plants, particularly, are a great hazard. Many of the exotic plants sold at nurseries are invasive. They frequently have exotic insects or their egg masses on the plant or in the soil. In some cases, exotic disease organisms are present on the plant or in the soil.

It is impossible to overstate the threat posed by exotics. The U.S.F.S. has listed invasive exotics as one of the greatest threats to our forests today. The National Park Service is aggressively treating exotic plant species on the Blue Ridge Parkway and in the Great Smoky Mountains National Park. The general public, however, remains largely ignorant of the destructive potential posed by this threat.

A. Invasive Exotic Diseases

The most eminent threat in the form of exotic disease is probably Sudden Oak Death (*Phytophthora ramorum*). This fungal disease has been killing oaks and other species on the west coast for several years. It has a wide variety of host plants, not all of which are being killed, but oak trees, rhododendron and camelias appear to be particularly susceptible to this organism. Based on species on the west coast and in Europe which have shown susceptibility, native species that could be adversely affected include northern red oak, southern red oak, beeches, ashes, firs, chestnuts, witch-hazel, huckleberries, blueberries, rhododendrons, mountain laurel, viburnum species and Leucothoe species.

In early 2004, it was discovered that a very large nursery in southern California shipped infected horticultural plants throughout the country, including to nurseries in North Carolina. The NC Dept. of Agriculture will be inspecting nursery stock and trying to identify, treat or destroy infected plants.

B. Invasive Exotic Insects

Hemlock is very common in both watersheds, but is prevalent along the streams. It is very effective in shading streams and moderating temperatures. This is important for trout and other cold water species. The hemlock woolly adelgid (HWA) is present in the watershed. This invasive exotic insect has devastated hemlock stands from Virginia, north. Virginia has lost approximately 80 % of its hemlock population, so far. The hemlock woolly adelgid is capable of eliminating native hemlock species from our eastern forests.

Currently, while individual trees can be treated to kill an infestation, repeated treatments are required every few years and treatments are expensive. Treatment is not practical in a woodland environment. The USFS has researched natural controls in the areas where the HWA is present. They have identified several predator beetles that are highly selective (feeding only on adelgids) and are releasing some species in the National Forests and on National Park Service lands in an effort to establish a balance on public lands between the adelgids and their natural predators. The predator beetle most commonly released is *Pseudoscymnus tsugae*, but researchers are studying other species for potential use. Some have been released on U.S.F.S. land in the Black Mountain area.

It is very difficult for private individuals to acquire predator beetles for release. A minimum effective number to release is approximately 2000, usually released in one heavily infested tree. The predator beetles can spread to other trees after release, can reproduce and survive our winters. The limiting factors to release are availability and cost. While NC State University, Clemson University and the University of Tennessee are starting production facilities to raise the predator beetles, there has only been one private company producing the beetles up until this year, and the U.S.F.S. has purchased virtually all of their production. It may be possible

to get a release in the watershed due to the public function of the area as a water source and its extensive adjacency to the parkway.

Elongate hemlock scale (*Fiorinia externa*) is another serious, exotic pest plaguing hemlocks in western North Carolina. Though its introduction to the area is recent, its rapid spread has gained it notoriety. Elongate scale was first discovered in Montreat two years ago. Similar to HWA, individual trees can be treated to kill an infestation; but repeated treatments would be required every few years, and treatments are expensive. Though the treatments are less frequent, they are still not practical in a woodland environment. Several years of heavy infestation are required for EHS to kill a hemlock tree, significantly longer than by HWA. As infestations are recent, relatively little is known about this insect. However, alternative treatments may emerge in the future.

Other invasive exotic insects will become problems over time. Perhaps the one with the most destructive potential that has already been identified in western North Carolina is the gypsy moth (*Lymantria dispar*). This insect is capable of killing thousands of acres of oak trees, its preferred host, by defoliating trees for several years in a row. This would be devastating to both large and small mammal populations that are most dependent during the fall and early winter months. The risk of infestation is increased by the proximity of the Blue Ridge Parkway and its north/south travelers, particularly in campers. The moth lays egg masses on parked campers in the northern areas. The egg masses are transported south in the spring with vacationers, where the larvae hatch out. The overlooks along the parkway would be potential points of infestation.

Other potential problem insects include the Asian longhorned beetle, which prefers maple species, and the emerald ash borer. These species have not yet been identified in the western North Carolina Mountains, but could find their way here eventually.

C. Invasive Plants

The following invasive exotic plant species were found within the North Fork or Beertree Watersheds.

Chinese plume grass, or silvergrass	<i>Miscanthus sinensis</i>
Nepalese browntop grass	<i>Microstegium vimineum</i>
Autumn olive	<i>Elaeagnus umbellata</i>
Common periwinkle	<i>Vinca minor</i>
Multiflora rose	<i>Rosa multiflora</i>
Princesstree	<i>Paulownia tomentosa</i>
Tree-of-Heaven	<i>Ailanthus altissima</i>
Oriental bittersweet	<i>Celastrus orbiculatus</i>
Chinese Privet	<i>Ligustrum sinense</i>
Wineberry	<i>Rubus phoenicolasius</i>

Of these, Nepalese browntop, Chinese silvergrass and oriental bittersweet were the most common. Nepalese browntop is present in most of the forest roads and trails. It is very shade tolerant, tends to occupy the moist cove sites, is not utilized by wildlife species for forage and forms thick stands to the exclusion of native species. In Biltmore forest, where the deer population is so high that a browse line is evident, the deer do not feed on this species. In the winter, it dies back, leaving a mat of dry, straw-like material that will carry a fire in areas where the native plant fuels tend to retard fire progression.

Chinese silvergrass is found in small patches scattered throughout the watershed, as well as extensively in one 10-acre stand in the main valley. The source of infestation is the dam of North Fork Reservoir, which was planted with Chinese silvergrass. Chinese silvergrass is very shade tolerant and highly flammable. Dead stems are retained as new stems emerge, creating a flashy contiguous fuel capable of carrying a hot fire very rapidly through a hardwood forest. On steep slopes, a fire in heavy silvergrass ground cover would be very difficult to stop. The sprinkling of silvergrass throughout the watershed now will become large stands of silvergrass in the future. It is a prolific seed producer.

Oriental bittersweet is a climbing vine that kills trees by denying them sunlight, in a manner similar to kudzu. Unlike kudzu, oriental bittersweet is shade tolerant, thriving in a wooded environment. The additional weight of the vines and surface area available for ice formation also cause extensive tree losses during ice events. The openings created by the fallen trees are quickly exploited by the bittersweet vines, which climb adjacent trees. Later ice events create larger openings, but the bittersweet prevents trees or native shrubs from occupying the openings. Bittersweet produces large numbers of berries, which are instrumental in its spread. It was widely used in making holiday wreaths until its recent addition to the noxious weed list in NC and cannot be planted or sold.

The remaining invasive exotics are not found in great numbers, but could become problematic over time. Chinese privet, multiflora rose and tree-of-Heaven are particularly invasive.

8. WILDLIFE SPECIES

Mammals observed or thought to be in the watershed areas include black bear, whitetail deer, bobcats, coyotes, foxes, raccoons, opossums, beavers, skunks, cottontail rabbits, otters, grey squirrels, chipmunks, mice, moles, bats and short-tailed shrews.

The watersheds are thought to harbor the highest population density of black bears of any area in western North Carolina. The bears depend on acorns and hickory nuts, as well as soft mast species such as grapes, cherries and pokeberry in the fall. They eat insects, assorted plant leaves, roots and fruits during the spring and summer.

White-tailed deer depend on the acorn crop in the fall as well, but browse foliage from honeysuckle, greenbrier, forbs and twigs during the winter spring and summer. Fallen yellow-poplar blooms are an important source of early spring nutrition. Deer eat soft mast (blackberries, raspberries, blueberries, grapes, etc.) when available.

Wild turkeys and ruffed grouse are present although the grouse population is sparse. They eat soft mast and seeds in the summer and early fall. They eat seeds, acorns, hazelnuts, dogwood berries, holly berries, birch buds, hemlock buds and evergreen forbs, such as cinquefoil and wild strawberry, during the fall and winter. Both species need open “bugging areas” for their poults and chicks in the spring. These “bugging areas” are areas of early successional vegetation where grasshoppers, caterpillars and other insects can be found, providing a high protein diet for the fast growing young. Fields, road edges, burned areas and cutover areas are examples of early successional areas.

Woodcock are probable visitors for at least part of the year. They eat worms and tend to seek out soft, moist soils in coves or bottomlands. Mourning doves were observed around the small field, and waterfowl of various types utilize the reservoirs seasonally.

Hawks, owls, turkey vultures, shrikes, blue jays and crows are probable permanent residents. The hawks and owls are predators of small mammals, such as mice, chipmunks, squirrels and rabbits, but will occasionally take birds. The shrikes eat insects, small birds, reptiles, mice and shrews, impaling them on thorns for safe keeping. The turkey vulture is a carrion eater. The crows will eat carrion, fruit, nuts, eggs, seeds and sprouts. Blue jays will eat seeds, nuts, insects and other bird eggs.

Song birds thought to utilize the watershed areas include warblers, buntings, towhees, sparrows, cardinals, mockingbirds, wood thrushes, woodpeckers, whip-poor-wills, chickadees, tufted titmice, nuthatches, wrens, finches and robins. Other songbirds are probably in residence at various times of the year.

Diets are varied, but seeds, berries and insects comprise most of the food requirements. Different species are adapted to exploiting particular resources. Woodpeckers and nuthatches specialize in insects found on, and in, trees and snags. Nuthatches and vireos feed in the branches for insects, while wrens seek insects in brushy areas closer to the ground. Mockingbirds favor the brushy environment, as well. Robins and thrushes seek worms, other insects or fruit at ground level. Whip-poor-wills are adapted to catching flying insects.

Different species of warblers are adapted to different conditions, and they are predominantly insectivores. . As insects are very important in the diet, warblers often nest in one habitat type and the young move quickly to areas where insects are abundant (disturbed areas, early successional types, etc. see above) Cerulean warblers favor mature deciduous hardwood forests that feature occasional very large trees interspersed with gaps and openings. Golden-winged warblers, on the

other hand, require early successional areas at higher elevations. Both species are declining in numbers.

Finches, cardinals, chickadees, titmice, towhees and sparrows are primarily seed eaters.

The watersheds offer good habitat for species adapted to more mature conditions, such as cerulean warblers and wood thrushes, but little habitat is available for species requiring early or mid successional areas, such as golden-winged warblers and ruffed grouse. As noted, even species favoring mature forests need disturbed areas and most species present would benefit to some degree by increasing early successional habitats. These areas would provide more variety of browse, forage and nesting sites for species requiring brush or ground cover. In addition, many plants of concern also are dependant on the disturbance created by these areas.

The oak/hickory component is very important to the wildlife in the watershed. Large stands dominated by yellow-poplar are less beneficial in providing habitat for the diverse populations existing in the watershed. The overstory species composition is slowly changing to one that will produce more seeds than acorns and nuts. This change will reduce the amount of hard mast produced and reduce the habitat quality for species such as black bear, whitetail deer and wild turkey and many nongame species, which are heavily dependant on acorns and hickory nuts. Stands dominated by yellow-poplar and maple will not support good populations of large mammals. Some mast will be produced, but it will not be as beneficial for wildlife as acorns and hickory nuts.

9. SOIL AND WATER

Buncombe County is currently undergoing a new soil survey. Existing data from the old soil survey is available in digital form through the county GIS program, but the soil scientists conducting the new survey advised against utilizing the old survey data. The new data should be available in digital form in 2005.

Preliminary soils work indicates small areas of **Dellwood-Reddies land complex, 0-3% slopes, occasionally flooded (53A)** are found in the bottomland area. Streamside areas are characterized by **Tate loams, 2-30% slopes (symbol 121B, C or D), and Toecane-Tusquitee complex, 8-50% slopes (symbol 181C, D or E).**

Side slope soils include:

**Tusquitee gravelly loam, 2-30% slopes (symbol 801B, C or D),
Edneyville-Chestnut complex, 15-95% slopes, stony (803C, D, E or F),
Ashe-Cleveland-Rock outcrop complex, 15-30% slopes, (804C or D),
Ashe-Cleveland-Rock outcrop complex, 30-95% slopes, very bouldery (804E or F),
Balsam-Tanasee complex, 15-50% slopes, extremely bouldery (807C, D or E)
and**

Porters-Unaka complex, 8-95% slopes, stony (841C, D, E or F)

Common soils on or near ridge tops include:

Wayah-Burton complex, windswept, 8-95% slopes, bouldery (symbol 847C, D, E or F),

Wayah-Burton complex, 30-50% slopes, bouldery (848 E),

Wayah-Burton complex, 50-95% slopes, rocky (848 F),

Burton-Craggey complex, windswept, 15-30% slopes, rocky (811D)

Burton-Craggey-Rock outcrop complex, windswept, 30-95% slopes, very bouldery (811E or F)

Craggey-Rock outcrop-Clingman complex, windswept, 15-95% slopes, rubbly (812D, E, F).

Evard-Cowee complex, 15-95% slopes, stony (788C, D, E or F) and

Unaka-Rock outcrop complex, 15-95% slopes, very bouldery (804C, D, E or F).

Erosion hazard is slight for the Dellwood-Reddies soils. Ashe, Cleveland and Chestnut soils have severe erosion hazard ratings. Most of the other soils have erosion hazards from slight to moderate until slopes are greater than 35%.

The better soils will support yellow-poplar. The poorest soils will not. Chestnut oak and scarlet oak dominate the poorer, dry sites. White oak and northern red oak are found on better to average sites. Below are comparisons of the productivity of some of the common soils in the watersheds. Site Index estimates from the soil survey are the basis for comparison, Site Index is the average height in feet to which a tree of a given species will grow on a given site in 50 years.

SITE INDEX BY SPECIES

Soil Type	Yellow-poplar	Northern Red Oak	White Oak	Chestnut Oak
Reddies	105			
Toecane	104			
Tusquitee	103			
Dellwood	100			
Edneyville	98	83		
Chestnut	97	75	70	69
Tate	92			
Evard	90		75	
Ashe				57
Cowee	80			53
Cleveland		60		45

Water quality within the watersheds is excellent. The only apparent problem with water has been total available volume during the recent extended drought.

Drought conditions of that magnitude are not anticipated to be recurring events.

IV. FIRE HAZARD:

Fire hazard evaluation includes several components, each of which may adversely affect the overall hazard.

1. RISK

One component is the risk of ignition, or the probability that a fire will occur. Common sources of ignition of wildfires include arson, escaped campfires and warming fires, debris burning and lightning. The limited access to the watershed reduces the risk associated with campfires and warming fires, but does not preclude a fire started by unauthorized camping, hiking, hunting or fishing. The watershed has a history of trespassers and a long boundary line. The possibility that a fire could result from unauthorized activity is significant.

Similarly, while no debris burning takes place within the watershed area, an adjoining landowner could allow a debris fire to escape into the watershed. Burning leaves or brush piles, burning paper trash in a barrel or burning off a spring garden plot are all potential debris burning ignition sources.

Based on historical experience, arson does not appear to pose a serious threat as an ignition source.

Lightning is an ever present potential ignition source. It can strike anywhere within the watershed, although it is more likely to strike on a ridge. It is also more likely to strike in the spring, summer or fall when conditions may be dry.

2. TOPOGRAPHY AND ASPECT

Fire will burn faster uphill than downhill because hot air rises. The fire preheats and dries out fuels in front of the flames burning uphill, making them easier to ignite. Flame lengths will be longer and embers will start new fires in advance of the main fire, increasing the rate of advance.

Aspect refers to the direction that a slope faces. Fires on south and west facing slopes will burn hotter than those on north facing slopes because the sun dries the fuels on these exposed sites more rapidly. North facing slopes tend to be more moist. The watersheds are comprised of significant areas of steep terrain and the watersheds generally face south. Ridges extending into the watersheds have north facing slopes and south facing slopes. Fires starting along the perimeter ridges would tend to burn more slowly because they would be burning downhill. For this reason, a fire starting from debris burning outside of the watershed poses less risk of damage than one started by a trespasser or by lightning on the lower slopes with the watershed. A fire started on the lower slopes of a south facing ridge would be difficult to stop before it reached the ridgeline of the watershed.

3. FUELS

Fuels in the forest will have a large impact of the intensity of a wildfire. Hardwood leaf litter will burn readily and carry a fire, but a wildfire in this type of fuel is more easily controlled than one burning in a mountain laurel thicket.

This type of fuel is typical of north facing slopes. On south facing slopes and dry ridges, mountain laurel thickets are common.

Waxy mountain laurel leaves carry the fire above the ground and the stems prevent effective use of hand tools to establish a break in the fuels. Pre-existing roads and trails are important as breaks in the potential fuel, where firefighters have a chance of stopping a fire. On steep terrain, however, fire can easily jump over narrow breaks.

Grassy fuels are very “flashy”. They ignite easily and burn very rapidly when dormant, or when old stems are persistent. Grasses that form a uniform layer across an expanse of ground, such as broom sedge in piedmont fields or wiregrass in the sandhills and coastal plain, are such fuels. Areas where grassy ground covers are common historically were subjected to repeated wildfires. If not set intentionally by Native Americans, lightning repeatedly ignited these areas.

Although periodic fire in the past created grassy savannahs in parts of the Appalachians,

the watershed areas do not have extensive grassy fuels. The exclusion of fire over the last 50 years has allowed the development of more extensive mountain laurel and rhododendron thickets under a closed hardwood canopy. The introduction of shade tolerant, invasive exotic species (*Miscanthus* and *Microstegium*) into the mountains, however, is creating very dangerous fire conditions. We now have the potential of developing a flashy grass layer interspersed with laurel thickets on steep slopes. A wildfire in such conditions could cause catastrophic damage to the ecosystem and to water quality. Such a fire would be sufficiently hot to kill large areas of canopy and understory tree species. The invasive grasses would rapidly expand after the fire, taking advantage of the additional sunlight. Subsequent fires would be hotter and larger, as tree cover allows the sites to dry out and more grass would fuel each new fire. Fires would occur more frequently because grass ignites more easily than hardwood leaf litter. With each fire, the soils are exposed to erosion and the watershed exposed to siltation. The ecosystem created would not support most of the existing animal species and many native plant species would be unable to compete with the combination of fire and invasive exotic species.

At this point, Nepalese browntop (*Microstegium vimineum*) is present along many of the roads and trails. This grass is green during the growing season, but forms mats of dead vegetation after frost. It isn't eaten by wildlife and can completely dominate moist cove sites, smothering native plants species.

Chinese silvergrass (*Miscanthus sinensis*) is showing up in spots throughout the North Fork Watershed. There is an area of more than 10 acres where this grass has become the dominant ground cover and is spreading. This grass is a year round fire hazard. It is shade tolerant and is a prolific seed producer. The source of the silvergrass infestation within the watershed is the extensive planting of the species on the dam of Burnett Reservoir.

4. WEATHER

Weather conditions at different times of the year affect the risk of wildfires. Winter conditions tend to be cool and wet. Lightning is rare and there is less pedestrian traffic in the winter woods. Summer conditions also tend to be wet, but periods of hot dry weather can create high fire danger conditions. Fall weather brings a fresh load of dry, fluffy fuels to the forest floor in the form of leaf fall. Fall is frequently a dry time in the mountains, but pedestrian traffic is high and leaf burning is common. Wildfires are common at this time of year. Spring conditions may be the most hazardous. Spring months can be very dry, with cold fronts bringing high winds and low humidities for days at a time. Prevailing winds in the spring and fall tend to be out of the southwest, west or northwest, although fires on steep terrain create strong updrafts in the uphill direction and the terrain causes erratic winds. Eddies are created as winds pass over ridges and wind accelerates as it passes through gaps and saddles.

GENERAL RECOMMENDATIONS

I. WATER QUALITY:

1. ROADS AND TRAILS

First priority is primary roads. Secondary roads are also very important for fire control access, but will require more work. Many are located near streams and frequently cross streams.

- Identify secondary roads important to be maintained as access for fire control, including those not currently utilized, mapped or named and marked on the ground. Identify those roads and trails that should be closed due to poor design or location.
- Upgrade primary and secondary roads where needed with gravel and water control structures. (ditches, broad based dips, crown the road where necessary, locate turnouts well away from stream crossings, gravel approaches to stream crossings, dig sediment traps at existing located turnouts near streams)
- Repair existing bridge structures (replace rotten boards) on primary and secondary roads.
- First priority on secondary road repair is to gravel approaches to stream crossings, repair existing bridges and divert water off of the roads and into the woods away from streams and crossings, where possible. Utilize sediment traps where turnouts are necessary in proximity to streams.
- Seed cut banks and bare soil surfaces with creeping red fescue (CRF) to stabilize soils and slow water on road surfaces. Creeping red fescue is shade tolerant with a low growth habit. Strips of CRF planted on the downhill side of roads at broad based dips will slow water diverted into the woods.
- Bands of creeping red fescue established in the road, angled downhill at 30° toward the outside edge of the road will slow water flow on steep grades and divert water off of the road. An outfall must be provided on the outside edge of the planting to prevent water from re-entering the road.
- In locations where the road is enclosed by steep banks on both sides, heavily seed the entire surface to slow water flow and create an outlet at the first possible location. Steep cut banks should be graded back to a 3/1 slope where possible to

allow establishment of a CRF cover. Cut banks are a continual source of erosion and stream sedimentation.

- Close and rehabilitate old roads and trails that are not serviceable due to poor design or location. Grade cut banks back to 3/1 slopes, construct water bars and turnouts and seed road beds and cut banks with CRF.
- Reduce the number of ford type stream crossing crossings where possible. Replace with bridges where possible, or consider closing roads that ford streams but are not necessary for access.

2. STREAMSIDE MANAGEMENT ZONES

Maintain a system of streamside management zones (SMZs) around the reservoirs and along tributary streams. SMZ width should be determined primarily by the slope of the surface adjacent to the water body, and the relative size (category) of the water body. The following charts indicate suggested SMZ widths based on slope and category. In application, widths may vary, based on factors affecting erosion hazard, such as soil type and area drained.

Management activities allowed within the Primary SMZ are restricted to those necessary to maintain or improve roads, fire pre-suppression or control, and control of invasive exotic species.

Management activities allowed in the Secondary SMZ area include road maintenance, fire pre-suppression or control, invasive exotic species control, single tree selection timber harvest, crop tree release and understory manipulation for regeneration purposes. The primary consideration is to maintain a nearly contiguous canopy. Exceptions may be allowed on a case by case basis as long as water quality is ensured and the variance furthers objectives set forth in the plan.

Outside of the SMZ zones, all of the aforementioned activities may take place, as well as small group selection or such other forest practices as may be deemed appropriate for the watershed.

SUGGESTED RESERVOIR SMZS

Category	Slope Range	Prim. SMZ Width	Sec. SMZ width	Tot. SMZ Width
Reservoir	2-10%	100'	50'	150'
Reservoir	10-30%	140'	50'	190'
Reservoir	30-50%	180'	100'	280'
Reservoir	> 50%	200'	100'	300'

SUGGESTED STREAM SMZS (Each Side)

Category	Slope Range	Prim. SMZ Width	Sec. SMZ Width	Total SMZ Width
Ephemeral	All	25'	-0-	25'
Intermittent	All	50'	As needed	50'+
1 st order	0-20%	50'	50'	100'
1 st order	20-40%	50'	100'	150'
1 st order	> 40%	100'	100'	200'
2 nd order	0-20%	75'	75'	150'
2 nd order	20-40%	100'	75'	175'

2 nd order	40-60%	100'	100'	200'
2 nd order	> 60%	200'	100'	300'
3 rd + order	0-20%	50'	150'	150'
3 rd + order	20-40%	100'	150'	250'
3 rd + order	40-60%	150'	150'	300'
3 rd + order	> 60%	200'	200'	400'

II. FIRE CONTROL AND EMERGENCY SERVICES:

Fire pre-suppression efforts should be focused on two issues. The first is ensuring that fire control crews and other emergency service personnel have rapid access to as much of the watershed as is practical and good maps and road signs to find their way around. Current conditions do not meet that need. Secondary roads have bridges with rotting or missing boards and trees are continually falling across roads. Roads exist that are not shown on current maps and bears keep tearing down wooden road signs that identify roads and streams.

The second issue is controlling the spread of invasive exotic species that will, if left unchecked, change the nature of the fire hazard in the watershed. At this point, the hazard is evident, but control is possible. Failure to act soon will have the same effect as failure to attack a wildfire as soon as it is detected. Delay will allow the situation to progress to the point that control is not an option. The consequences may be permanent.

- Place signage at road intersections and named stream crossings identifying road numbers and streams crossed for ease of navigation by fire crews. Consider aluminum or vinyl flat signs, stenciled letters on trees or signs placed on fence posts. Experiment with sign types and placement to find a system that the bears will not tear down.
- Repair existing bridges and add sufficient cover (at least 12 inches) over existing culverts to ensure the culverts will not be crushed.
- Cut trees from the slopes above roads for a distance of approximately 50 feet and any trees below the roads that are leaning toward the road to reduce treefall across the access roads. Where the ground is level on both sides of a road, only the trees leaning towards the road need to be cut.
- Chinese silvergrass and Nepalese browntop infestations should be treated to control their spread. Both of these invasive exotics have the capability of growing in shaded conditions. They add a flashy fuel component to the forest that will increase the incidence and severity of wildfires if not controlled.

Fire suppression should be closely coordinated with the NC Division of Forest Resources. In the event of a wildfire within the watershed, one employee should be designated to man the gate until all suppression crews have left the watershed.

- A tube of maps should be kept in a location where they are available 24 hours a day for watershed personnel. The person designated for gate duty should take the tube with him and hand out maps to any fire control personnel entering the property. If time permits, the location of the fire should be marked on the maps.
- Helipads should be kept mown and accessible by service trucks. Roads leading to helipads are a high priority to upgrade and maintain.
- Radio frequencies should be compatible between Forest Service radios and watershed radios to facilitate communications.

III. FOREST REGENERATION

A forest regeneration system is important to meet several management objectives. Manipulation of the forest to ensure that northern red oak and white oak are regenerated over time, as opposed to red maple, will preserve and improve habitat for all hard mast dependent species. Creation of small early successional areas will benefit species dependent on soft mast for part of their diet and species dependent on ground cover for nesting sites, browse, forage or cover. These species include black bear, wild turkeys, ruffed grouse and a wide variety of birds. Ruffed grouse will continue to utilize the areas long after they cease providing early successional conditions.

Several forest regeneration systems may be employed to meet the objectives. One system is small group selection. Under the small group selection system, small pockets of timber are harvested to create a number of small openings (.5 to 2 acres, depending on shape and species composition) within a stand. These will comprise 10-15% of the stand. Approximately 10-15 years later, the stand will be revisited and another 10- 15% of the stand will be harvested in small pockets. This process is repeated continually. All of the stand will have been included in a small group by the time 75 to 100 years have passed, but the first areas treated will have 75 to 100 year old trees in pockets throughout the stand. At no time is the canopy removed from more than about 15% of the area in a stand, and that area is scattered all over the entire stand. Different stands are treated each year to provide areas of early successional areas for wildlife and to encourage oak regeneration.

Small group selection will allow oak regeneration to develop within the edges of the stand adjoining the small openings, where light is sufficient for oaks, but inadequate for yellow-poplar. Yellow poplar will probably dominate the center of the small openings on the better sites. The mix of yellow-poplar and oak may help deter gypsy moths if an infestation were to occur. Solid stands of oak are highly susceptible.

Shelterwood cuts offer the opportunity to create two-aged stands. These are beneficial to grouse, bear, white-tail deer and a variety of birds. The trees selected for shelter and the density of the shelterwood can be used to manipulate species composition of future stands.

Regeneration using small clearcuts will also be appropriate under certain conditions. Where advance oak regeneration is present, small clearcuts would allow the regeneration of a site to oak species, while providing important early successional areas for wildlife. Clearcut sizes would be determined by conditions, but anticipated clearcut sizes would be between 5 and 10 acres.

Single tree selection has not been shown to be an effective system for regeneration of shade intolerant species, such as oak, ash, hickory and yellow-poplar, however, individual trees may be harvested to meet other objectives other than regeneration. They may be selected for harvest to manipulate species composition in the overstory and to enhance conditions for mast production, particularly in the secondary buffer zones. It may be useful in crop tree management, where crop trees are selected for masting ability and are favored by removing individual crown competitors to increase the available light to the crop tree.

It is important to maintain as many “tools of management” for use as possible to deal with variable conditions and objectives. No single system is appropriate for all areas.

WILDLIFE MANAGEMENT:

Wildlife management recommendations are based on several objectives and considerations. The Asheville Watersheds have one of the highest densities of black bears in western NC. They act as a reservoir for the species, providing a safe haven for rearing young and vital natural food supplies. Improving the variety, timing and quantity of the food supply will help support the bear population. According to Wildlife officials, bears benefit from a diversity of habitat types, each providing food during different times of the year.

Ruffed grouse populations are in decline in western NC, but they are present in the watershed in small numbers. Improving habitat for ruffed grouse will help ensure their continued presence in the area. Grouse will take advantage of small group cuts, but they are not the best system for their habitat. The areas are too small to contain home ranges. Clearcuts or shelterwood/two age cuts are far better for grouse.

Neo-tropical songbirds utilize the watershed annually. Some species require early successional habitat for nesting and forage; others prefer the mature closed canopy conditions that are prevalent on the watersheds. Creating a diversity of habitats will benefit a number of species that are not well served by existing conditions. Partial harvests, such as thinnings and shelterwood cuts, help develop mid-stories and under-stories that are beneficial for many songbirds.

Creating some limited areas of early successional vegetation will meet several of these objectives. Grouse will benefit from both early successional vegetation and from the young seedling/sapling stands that will grow out of these areas. The bears and some neo-tropical bird species will benefit primarily from the early successional areas. To maintain the benefit, a few early successional areas should be created every few years.

- The clearing of 50 feet of trees above the access roads will create significant areas of early successional plants. Soft mast production should be high in these areas for several years. The areas should be cleared on about every 10 years
- Mowing the helipads will maintain additional areas. The edges of the helipads already produce sassafras berries, blackberries, wineberries and sumac. The woody species may need to be cut back every 3 years to prevent tree development in species such as sassafras.
- Small group selection cutting, small shelterwood cuts and small clearcuts will create small openings throughout the lower elevations of the watershed. These systems offer the opportunity to periodically create new successional areas, replacing those that grow up and close crown. (See Timber Management section)

FOREST HEALTH:

It is worth pursuing asking the US Forest Service or the Park Service to release *Pseudoscymnus tsugae* into the watershed area in an attempt to control the hemlock woolly adelgid populations and preserve the eastern and Carolina hemlocks.

It is highly recommended that existing stands and clumps of Chinese silvergrass and Nepalese browntop be treated for control while that option is still viable. This may be a narrow window of opportunity.

Monitoring for gypsy moths should be an ongoing effort. This is accomplished using small cardboard traps with pheromone attractant baits.

A plan of action should be in place to deal with a new gypsy moth infestation found within the watersheds. My recommendation is to treat any infestation aggressively with *Bacillus thuringiensis kurstaki* (B.t.k.), a naturally occurring organism found in soils. This organism is utilized by organic growers for control of caterpillar pests in food crops. It has no effect on bees, fish, birds, mammals or water supplies. It is broken down by sunlight and other organisms within 3-7 days after application and does not reproduce or accumulate in the environment. It is only effective on caterpillars that are in their 1st, 2nd or 3rd instar stage (have not molted more than twice). These caterpillars will be less than 5/8 inch long. Timing of treatment is important. Generally, the month of May is the time to treat with B.t.k., preferably early May. The earlier an infestation is treated, the smaller the area will be that requires treatment. This is not a “wait and see” type insect.

There is no action to be taken regarding sudden oak death at this time. Any landscaping planting done around the facilities should be confined native species grown locally. Plants grown outside of the region and sold locally may carry the fungus on the plants or in the soil. Rhododendrons and camelias are potential carriers, but are not the only ones.

The American Chestnut Foundation is very close to producing chestnut trees that have the good characteristics of American chestnut, but with blight resistance. The field along the main road in North Fork Watershed would be an ideal place for out-planting a test plot of the latest progeny. As proven resistant seedlings become available, the watersheds would be excellent places to re-introduce the American chestnut. Members of the Foundation who have contributed to the development of the resistant species will be given a priority in obtaining the resistant seedlings. I recommend that the City join the Foundation and participate in the final phases of research and development. This would involve very little expense, time or intrusion, but would allow the watershed to participate in the early phases of American chestnut restoration. Membership in the American Chestnut Foundation is only \$40.00 per year, although a larger contribution would be appreciated.

American chestnuts were once the largest mast producer for wildlife. Their re-introduction would be in line with the goals for both wildlife and forest health.

SCENIC VIEW:

The view from the Blue Ridge Parkway is a consideration in management of the watersheds. The activities recommended in this plan will have a minimal impact on views from the Parkway. Openings created for improved fire control access, for wildlife habitat improvement or tree regeneration will be small enough to be largely screened from view by surrounding trees. Any visible impact that may be discernable will be more than offset by the multiple benefits from the activity.

